INVESTIGATOR'S ANNUAL REPORT

United States Department of the Interior

National Park Service

All or some of the information you provide may become available to the public.

OMB # (1024-0236)
Exp. Date (11/30/2010)
Form No. (10-226)

Reporting Year:	**Park:**	**Select the type of permit this report addresses:**
2009	Shenandoah NP	Scientific Study

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Project Title (maximum 300 characters):

Modeling and Restoration of American Butternut in Eastern Parks

Park-assigned Study or Activity #:	**Park-assigned Permit #:**	**Permit Start Date:**	**Permit Expiration Date:**
SHEN-00365	SHEN-2009-SCI-0009	Apr 22, 2009	Oct 31, 2009

Scientific Study Starting Date:	**Estimated Scientific Study Ending Date:**
Apr 22, 2009	Dec 31, 2009

For either a Scientific Study or a Science Education Activity, the status is:

Completed

For a Scientific Study that is completed, please check each of the following that applies:

_X_ A final report has been provided to the park or will be provided to the park within the next two years

__ Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park

__ All collected and retained specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed

Activity Type:

Research

Subject/Discipline:

Plant Communities (Vegetation)

Purpose of Scientific Study or Science Education Activity during the reporting year (maximum 4000 characters):

Butternut, or white walnut (Juglans cinerea), is a medium-sized hardwood species native to the eastern forests of North America. The species is utilized for veneer and lumber and is an important producer of hard mast for wildlife. Additionally, the nuts are palatable for human consumption, and cultivars have been selected for orchard production.

Throughout the range of the species, butternut populations are experiencing severe declines due to an exotic fungus, Sirococcus clavigignenti-juglandacearum. The disease was first discovered in 1967 in southwestern Wisconsin, but is believed to have originated on the southeastern coast as much as 70 years ago. Butternut canker disease has infected populations throughout most of the species range, with the greatest impacts on southern populations. The progression of the disease begins with black lesions, or cankers, forming on the branches of trees, which are then spread by rain and wind to the boles. The main stem and branch cankers result in poor crown conditions with increasing disease severity; tree mortality is caused by eventual girdling of the bole. Forest Inventory and Analysis data indicate the disease has eliminated close to 80 percent of the butternut trees over a 30 year period in some southeastern states.

The rapid decimation of butternut populations has been considered so severe that the status of the species was reviewed by the U.S. Fish and Wildlife Service and harvesting of butternut on Forest Service lands has been restricted since 1993. Currently, the species is listed as a Federal species of concern and is recognized by the Detection Monitoring component of Forest Health Monitoring. To date, there has been no proven strategy for protecting butternut trees from the disease or returning resistant butternut trees to eastern forests. However, a survey for surviving butternut trees in the southern Appalachians has revealed clumped groups of trees that show no or extremely limited signs of infection by the disease and trees that are recovering from the disease (healing cankers). The survival of these trees in areas with massive die-off and in close proximity to dead and dying trees suggests the possibility of resistance or a debilitated fungus. If host resistance is present, then a backcross breeding approach could be a feasible strategy for producing resistant butternut trees. The success of a breeding program for restoration, however, is predicated by the ability to transfer resistance, the existence of a broad-based germplasm, and a thorough understanding of species site requirements. For National Park areas, restoration of local genotypes will be desirable because of NPS policies regarding introducing exotic germplasm. The first steps in this process is to locate trees and assess their overall health. Therefore, our objectives are as follows:

1. Compile a database of butternut locations within selected Shenandoah National Park and assess health of butternut trees using the Forest Health Monitoring (FHM) crown condition classification system.

2. Develop and test (field validation) a GIS-based predictive model to determine habitat characteristics of butternut within the Park.

3. If disease is present, conduct multivariate analyses to determine if disease severity is associated with specific landscape conditions.

4. Delineate potential restoration sites using knowledge of butternut habitat requirements and conditions unfavorable for the fungal pathogen, if any exist.

Findings and status of Scientific Study or accomplishments of Science Education Activity during the reporting year (maximum 4000 characters):

Modeling statistics and specifics have been developed throughout 2009. Additional Butternut locations and conditions were collected in 2009. The modeling effort is in its final stages and should be completed in 2010.

For Scientific Studies (not Science Education Activities), were any specimens collected and removed from the park but not destroyed during analysis?

No

Funding specifically used in this park this reporting year that was provided by NPS (enter dollar amount):	**Funding specifically used in this park this reporting year that was provided by all other sources (enter dollar amount):**
$10000	$0

List any other U.S. Government Agencies supporting this study or activity and the funding each provided this reporting year:

Paperwork Reduction Act Statement: A federal agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. Public reporting for this collection of information is estimated to average 1.625 hours per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the forms. Direct comments regarding this burden estimate or any aspect of this form to Dr. John G. Dennis, Natural

Resources (3127 MIB), National Park Service, 1849 C Street, N.W., Washington, DC 20240.